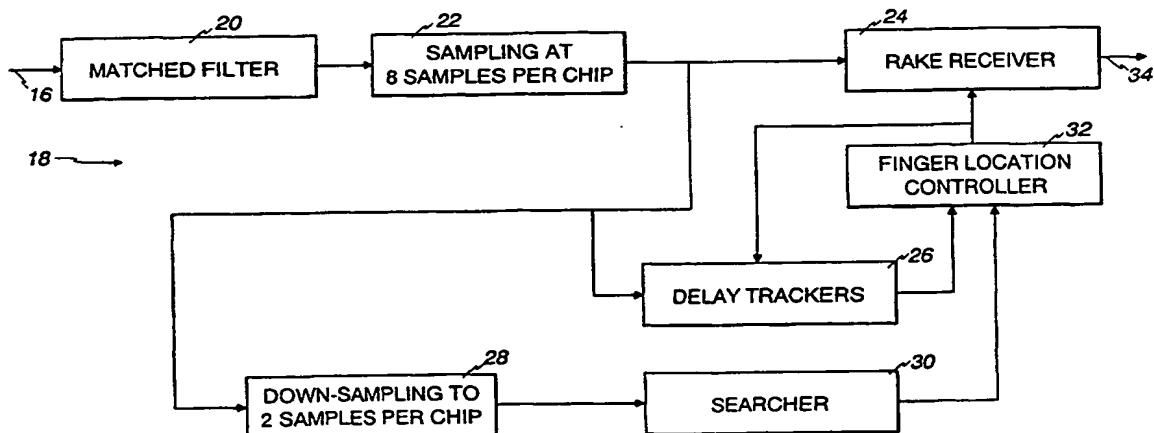




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: DELAY SEARCHER AND DELAY TRACKERS INTERACTION FOR NEW DELAYS ASSIGNMENT TO RAKE FINGERS



## (57) Abstract

A direct sequence spread spectrum receiver for operating in a multipath fading channel comprises a rake receiver having plural rake fingers. Each rake finger demodulates a received signal from one of plural channel paths. The output of the plural rake fingers are combined. Each rake finger utilizes a select assigned delay to synchronize to a delay of the one channel path. A searcher periodically performs a channel search on the received signal to detect new delays of strongest paths in the channel. Plural trackers, one for each channel path, adjust the select assigned delays between searches performed by the searcher. A delay controller is operatively coupled to the searcher and the tracker. The delay controller compares new delays of the strongest paths from the searcher to the select assigned delays and reassigns one of the select assigned delays with one of the new delays only if the new delay differs from the one select assigned delay more than a preselect minimum amount.

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## INTERNATIONAL SEARCH REPORT

Int'l Application No  
PCT/US 99/22437

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 H04B1/707 H04L25/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 H04B H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P, X	<p>EP 0 896 438 A (LUCENT TECHNOLOGIES INC) 10 February 1999 (1999-02-10)</p> <p>abstract column 2, line 21 - line 46 column 4, line 56 -column 5, line 23 column 8, line 2 - line 21; figure 5</p> <p style="text-align: center;">-/-</p>	<p>1,2,5, 14,15, 17, 21-23, 29-32</p>

Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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Date of the actual completion of the international search

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## INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/22437

## C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 718 998 A (NIPPON ELECTRIC CO) 26 June 1996 (1996-06-26)	14,15, 17,29
Y	abstract; claims 1-3	18,20, 33,35
A	column 4, line 24 -column 5, line 30; figures 2,6	1-5, 9-13, 21-25, 30-32
	column 10, line 10 - line 43; figure 8 —	
X	WO 95 12262 A (QUALCOMM INC) 4 May 1995 (1995-05-04)	14,15, 29,30
Y	page 1, line 15 - line 31	18-20, 33,35
A	page 7, line 29 -page 9, line 14	1-5, 9-13,16, 21-25,31
	page 28, line 29 -page 29, line 11; figures 8,9A-9D page 30, line 17 - line 25 —	
X	WO 97 19522 A (NOKIA TELECOMMUNICATIONS OY ;STAHLA LAURI (FI)) 29 May 1997 (1997-05-29)	36,37,39
Y	page 9, line 17 -page 11, line 9; claims 1,7,9,13; figures 2,3	18-20, 33-35 38,40
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X	GB 2 286 509 A (NOKIA MOBILE PHONES LTD) 16 August 1995 (1995-08-16)	36,37
Y	page 2, line 19 -page 3, line 18	18-20, 33-35 38
A	page 5, line 28 -page 6, line 12 —	
X	US 5 627 863 A (ASLANIS JAMES T ET AL) 6 May 1997 (1997-05-06)	36,39
A	column 2, line 43 - line 64 column 11, line 26 - line 62 —	37

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US 99/22437

### Box I Observations where certain claims were found unsearchable (Continuation of Item 1 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1.  Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:
  
2.  Claims Nos.: because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
  
3.  Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

### Box II Observations where unity of invention is lacking (Continuation of Item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1.  As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
  
2.  As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
  
3.  As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
  
4.  No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. Claims: 1-8,21-28

A direct sequence spread spectrum receiver with RAKE demodulation, a searcher, trackers and a controller to detect whether or not the delays found by the searcher should be re-assigned to the ones tracked by the trackers. The controller further detects if one of the searcher delays differs from an already tracked delay more than a preselected minimum amount.

2. Claims: 9-13

A direct sequence spread spectrum receiver and method with RAKE demodulation, a searcher, trackers and a controller to detect whether or not the delays found by the searcher should be re-assigned to the ones tracked by the trackers. The controller further detects if each of the searcher delays differs from an already tracked delay more than a preselected minimum amount (which excludes the reassignment according to group 1).

3. Claims: 14-20,29-35

A direct sequence spread spectrum receiver with RAKE demodulation, a searcher, trackers and a controller to detect whether or not the delays found by the searcher should be re-assigned to the ones tracked by the trackers. The controller further re-assigns the delays already being tracked with the closest one of the delays found by the searcher.

4. Claims: 36-40

A method for initialising demodulation information of a channel path by making and using channel measurements or using storing automatic frequency control information from a set containing one or more paths and initialising demodulation information of a second set containing one or more paths using stored information from the first set of paths.

**INTERNATIONAL SEARCH REPORT**

Information on patent family members

Inte'rnal Application No

PCT/US 99/22437

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